

Claims

We claim:

- 1 1. A three-dimensional television system, comprising:
 - 2 an acquisition stage, comprising:
 - 3 a plurality of video cameras, each video camera configured to
 - 4 acquire a video of a dynamically changing scene in real-time;
 - 5 means for synchronizing the plurality of video cameras; and
 - 6 a plurality of producer modules connected to the plurality of video
 - 7 cameras, the producers modules configured to compress the videos to
 - 8 compressed videos and to determine viewing parameters of the
 - 9 plurality of video cameras;
 - 10 a display stage, comprising:
 - 11 a plurality of decoder modules configured to decompress the
 - 12 compressed videos to uncompressed videos;
 - 13 a plurality of consumer modules configured to generate a plurality of
 - 14 output videos from the decompressed videos;
 - 15 a controller configured to broadcast the viewing parameters to the
 - 16 plurality of decoder modules and the plurality of consumer modules;
 - 17 a three-dimensional display unit configured to concurrently display
 - 18 the output videos according to the viewing parameters; and
 - 19 means of connecting the plurality of decoder modules, the plurality of
 - 20 consumer modules, and the plurality of display units; and
 - 21 a transmission stage, connecting the acquisition stage to the display stage,
 - 22 configured to transport the plurality of compressed videos and the viewing
 - 23 parameters.

1 2. The system of claim 1, further comprising a plurality of cameras to acquire
2 calibration images displayed on the three-dimensional display unit to determine the
3 viewing parameters.

1 3. The system of claim 1, in which the display units are projectors.

1 4. The system of claim 1, in which the display units are organic light emitting
2 diodes.

1 5. The system of claim 1, in which the three-dimensional display unit uses front-
2 projection.

1 6. The system of claim 1, in which the three-dimensional display unit uses rear-
2 projection.

1 7. The system of claim 1, in which the display unit uses two-dimensional display
2 element.

1 8. The system of claim 1, in which the display unit is flexible, and further
2 comprising passive display elements.

1 9. The system of claim 1, in which the display unit is flexible, and further
2 comprising active display elements.

1 10. The system of claim 1, in which different output images are displayed
2 depending on a viewing direction of a viewer.

- 1 11. The system of claim 1, in which static view-dependent images of an
2 environment are displayed such that a display surface disappears.
- 1 12. The system of claim 1, in which dynamic view-dependent images of an
2 environment are displayed such that a display surface disappears.
- 1 13. The system of claim 11 or 12, in which the view-dependent images of the
2 environment are acquired by a plurality of cameras.
- 1 14. The system of claim 1, in which each producer module is connected to a subset
2 of the plurality of video cameras.
- 1 15. The system of claim 1, in which the plurality of video cameras are in a
2 regularly spaced linear and horizontal array.
- 1 16. The system of claim 1, in which the plurality of video cameras are arranged
2 arbitrarily.
- 1 17. The system of claim 1, in which an optical axis of each video camera is
2 perpendicular to a common plane, and the up vectors of the plurality of video
3 cameras are vertically aligned.
- 1 18. The system of claim 1, in which the viewing parameters include intrinsic and
2 extrinsic parameters of the video cameras.

1 19. The system of claim 1, further comprising:

2 means for selecting a subset of the plurality of cameras for acquiring a
3 subset of videos.

1 20. The system of claim 1, in which each video is compressed individually and
2 temporally.

1 21. The system of claim 1, in which the viewing parameters include a position,
2 orientation, field-of-view, and focal plane, of each video camera.

1 22. The system of claim 1, in which the controller determines, for each output pixel
2 $o(x, y)$ in the output video, a view number v and a position of each source pixel $s(v,$
3 $x, y)$ in the decompressed videos that contributes to the output pixel in the output
4 video.

1 23. The system of claim 22, in which the output pixel is a linear combination of k
2 source pixels according to

3
$$o(u, v) = \sum_{i=0}^k w_i s(v, x, y),$$

4 where blending weights w_i are predetermined by the controller based on the
5 viewing parameters.

1 24. The system of claim 22, in which a block of the source pixels contribute to
2 each output pixel.

- 1 25. The system of claim 1, in which the three-dimensional display unit includes a
2 display-side lenticular sheet, a viewer-side lenticular sheet, a diffuser, and substrate
3 between each lenticular sheets and the diffuser.
- 1 26. The system of claim 1, in which the three-dimensional display unit includes a
2 display-side lenticular sheet, a reflector, and a substrate between the lenticular
3 sheets and the reflector.
- 1 27. The system of claim 1, in which an arrangement of the cameras and an
2 arrangement of the display units, with respect to the display unit, are substantially
3 identical.
- 1 28. The system of claim 1, in which the plurality of cameras acquire high-dynamic
2 range videos.
- 1 29. The system of claim 1, in which the display units display high-dynamic range
2 images of the output videos.
- 1 30. A three-dimensional television system, comprising:
2 an acquisition stage, comprising:
3 a plurality of video cameras, each video camera configured to acquire
4 an input video of a dynamically changing scene in real-time;
5 a display stage, comprising:
6 a three-dimensional display unit configured to concurrently display
7 output videos generated from the input videos; and
8 a transmission network connecting the acquisition stage to the display stage.

- 1 31. A method for providing three-dimensional television, comprising:
- 2 acquiring a plurality of synchronized videos of a dynamically changing
- 3 scene in real-time;
- 4 determining viewing parameters of the plurality of videos;
- 5 generating a plurality of output videos from the plurality of synchronized
- 6 input videos according to the viewing parameters; and
- 7 displaying concurrently the plurality of output videos on a three-dimensional
- 8 display unit.